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This paper provides guidance to installations for preparing an emergency/contingency plan to effectively address potential contamination of drinking water supplies, and for providing potable water during emergencies. A water supply contingency plan is required for each installation as part of its Water Resource Management Plan according to Army Regulation (AR) 200-1, Environmental Protection and Enhancement; AR 420-49, Utility Services; and the Overseas Environmental Baseline Guidance Document. Many primacy states also have contingency plan requirements. Past Environmental Compliance Assessment System audits have found that many installations do not have a potable water contingency plan.

14. SUBJECT TERMS

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POTABLE WATER EMERGENCY/CONTINGENCY PLAN WATER SUPPLY INFORMATION PAPER NO. IP 31-020

Prepared by:
U.S. Army Center for Health Promotion and Preventive Medicine
Water Supply Management Program

In Cooperation With:
U.S. Army Environmental Center
Environmental Compliance Division

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DEPARTMENT OF THE ARMY
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REPLY TO
ATTENTION OF

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POTABLE WATER EMERGENCY/CONTINGENCY PLAN WATER SUPPLY INFORMATION PAPER NO. IP 31-020

1. PURPOSE. This paper provides guidance to installations for preparing an emergency/ contingency (EC) plan to effectively address potential contamination of drinking water supplies, and for providing drinking water that meets compliance requirements during potential emergencies.

2. REFERENCES. Appendix A contains a list of references.

3. BACKGROUND.

a. GENERAL. Past Environmental Compliance Assessment System (ECAS) audits have found that many installations did not have a water supply contingency plan or that their plan was inadequate. Water utility emergencies have occurred at Army installations over the past few years. The responses to some of these emergencies have been inefficient, insufficient, and posed a threat to consumer health.

b. REGULATORY CRITERIA. A water supply contingency plan is required for each installation as part of its Water Resource Management Plan (WRMP) as stated in Army Regulation (AR) 420-49 (reference 1) and as required in the Overseas Environmental Baseline Guidance Document (OEBGD) (reference 2). The AR 420-49 also states that contingency plans should be in accordance with American Water Works Association (AWWA) Manual No. 19 (reference 3), TB MED 576 (reference 4), and primacy state guidance. The guidance in this paper has been prepared in accordance with this recommended information. A contingency plan is required as part of the U.S. Environmental Protection Agency's (EPA) Wellhead Protection Program (WHP) established under the 1986 amendments to the Safe Drinking Water Act (SDWA) (reference 5); however, not all states have EPA-approved WHPs. All host nation, state, and local regulations should be checked for contingency plan requirements or potential applicability.

c. USE OF THIS DOCUMENT. This guidance can be used by all installations world-wide, which either purchase or treat drinking water, to prepare an EC plan. The goal is to develop an EC plan that is simple and concise. The complexity of each plan is variable between installations

and the response actions that may be required. The basic plan elements can be completed and managed with limited effort. The written plan should be treated as a dynamic document that is periodically reviewed and improved.

d. PARAMOUNT IMPORTANCE OF OPTIMAL WATERWORKS OPERATIONS. The first line of disaster defense for any water utility should be the maintenance of optimal waterworks operations. Weaknesses in a water system's current operations will be magnified during times of emergencies (e.g., what may seem like a harmless leak may waste critical water supplies during an emergency). Readiness through current water supply performance evaluations with operational corrections; preventive maintenance, cross-connection control, and water conservation programs; sufficient routine monitoring (including for baseline water quality standards); and wellhead and watershed protection programs, can simplify and shorten a disaster event. Even if optimal operations currently exist, some system vulnerabilities may still be identified and addressed during the development of an EC plan.

4. THE EC PLANNING FUNDAMENTALS. The EC plan consists of four primary areas: essential elements, vulnerability assessments, disaster-specific emergency response actions, and mitigation actions. The essential elements and the results of the vulnerability assessments can be used to help develop or improve disaster-specific emergency response actions to meet the most critical installation requirements. The emergency response actions will identify necessary procedures to be carried out by facility personnel, using existing resources, to quickly, efficiently, and safely protect lives and property, minimize disaster impact, and restore potable water service. Actions to mitigate weaknesses in a water system, identified through vulnerability assessments and actual events, are additional essential steps of this plan. The plan should be updated periodically to reflect new information. Refer to Appendix B for a cover sheet recommended for each installation EC plan.

5. ESSENTIAL ELEMENTS OF EC PLANS. The elements listed below are considered essential for every EC plan. They can be incorporated into many disaster-specific emergency response actions as that area of the plan is developed further. Many of these elements can be requested at the same time, especially if the plan leader is a strong organizer and delegates responsibility. Requests for most elements can be set in motion in less than one working day. Furthermore, all element forms can be printed out from a floppy disk available upon request from the US Army Center for Health Promotion and Preventive Medicine (USACHPPM) (appropriate contacts and addresses are noted in paragraph 9). In most cases, no longer will the execution of emergency actions be interrupted because plan elements are missing. Operators and water utilities should obtain and begin using the following elements for emergencies immediately.

a. EMERGENCY NOTIFICATION REPORT. Carefully monitor and address any consumer water quality complaints. Personnel receiving calls from the public need to be trained to collect all necessary information during the initial call. Rarely can the caller be contacted again to obtain

more information. Refer to Appendix C, Form 1 (Appendix A, reference 6) for a sample report form to be used by utility personnel for receiving information. A supplemental reporting form for use in chemical incidents is also included in Appendix C, Form 2 (reference 5). A threat evaluation information form is located at Appendix C, Form 3 (reference 7). If a threat is received by letter, notify installation security first, do not handle the letter further.

b. PERSONNEL NOTIFICATION LISTS/LOGS. Develop a call-up list of key water utility personnel and their areas of expertise as shown in Appendix D, Form 1 (reference 6). Next, develop a list of key personnel which includes the installation commander and all key personnel with any role in providing a safe and adequate water supply. In addition to utility personnel, list representatives and subject matter experts from USACHPPM, Federal, state, and local environmental agencies, and public health information agencies, such as the Centers for Disease Control and Prevention and local medical authorities (reference 8). A sample list is shown in Appendix D, Form 2 (reference 9). Outline more detailed notification responsibilities, if necessary (e.g., who routinely contacts who). Maintain employee titles on all lists to help ensure plan stability even during periods of employee promotions or turnover. A good idea is to keep the current installation organization chart with these lists. Consider how key personnel will be reached if the power and phone service are out. Maintain a log for all emergency communications as shown in Appendix D, Form 3 (reference 6). As the plan develops, more comprehensive lists can be added as shown in Appendix D, Tables 1 (reference 6) and 2 (reference 10).

c. MAPS/SCHEMATICS/DESCRIPTIONS. Accurate distribution system maps, treatment facility schematics, and a written description of treatment processes are critical to every EC plan. Maps are needed because knowledgeable employees may be on leave, incapacitated, or isolated from the water facility during a disaster. With accurate water system maps and descriptions, other employees or external personnel may be able to assist in solving otherwise formidable problems. If you do not have these maps, request them in the interest of adequately responding to an emergency. A good example of a water utility description is shown in Appendix E. As part of the description, include the integral nature of equipment (e.g., low pressure may cause automatic shut-off of treatment equipment or pumps), seasonal considerations, and system shortfalls. The maps should show major valves and backflow prevention devices for isolating damaged areas to prevent the spread of contamination. As the plan develops, add descriptions of normal and alternate operating modes of equipment, additional equipment specifications with standard operating instructions (SOI), maps showing the watershed (topographic) with areas showing storage or transportation routes for hazardous materials or potential contaminants, and an elevation profile of the treatment facility and distribution system. Ensure system information is not available to unauthorized persons.

d. INVENTORY OF WATER FACILITY REPAIR/BACKUP EQUIPMENT, BACKUP COMMAND CENTERS, SUPPLIES, AND RECORDS. Make a list which includes all equipment or supplies which can be used for repair or replacement, communication, additional treatment, protection [e.g., self-contained breathing apparatus, first-aid, which includes all Material Safety Data Sheets (MSDS) for chemicals used at the facility], monitoring, analysis, or transportation. Ensure equipment is functional and easily accessible. Ensure that there are adequate supplies and replacement parts for emergency requirements. A water treatment facility should have a 30-day supply of necessary chemicals on-hand (reference 11) at all times in the event communication or transportation lines are out of service during extended disasters. Floodlights, portable generators (reference 12), compressors, and pumps are useful during many events. Ensure inventory of backup communication between the key decision-makers and field personnel. Include wireless communication frequencies and fax machines in the inventory, if available. If a potential need exists, provide or set aside phone numbers exclusively for contacting Public Affairs (PA) personnel, emergency agencies, or family members. A sample inventory is shown in the Table in Appendix F. A backup emergency operations command center (EOC) should be designated for use when the primary EOC is disrupted. Ensure all essential facility records and plans are protected and duplicated as needed. As the plan develops, more resources may become available through coordination with external agencies and utilities, as described later.

e. POWER OUTAGE/REPAIR/DAMAGE PROCEDURES. Establish standing operating procedures (SOPs) for the repair of facility and distribution system components in different areas. These procedures may then be able to be used in a whole host of disaster scenarios. The procedures should also include assessing damage, determining when a component is insufficient and if temporary systems are needed, and conducting disinfection, flushing, and bacteriological sampling after repairs. The procedures should also apply to contractors who service the installation. Develop in-house repair capabilities (reference 13) for challenging projects whenever possible. The resulting increased technical proficiency of installation personnel may be invaluable during a disaster. Several examples of basic repair procedures are shown in the Figure in Appendix G. Provide employees with helpful wallet-sized cards outlining procedures, as necessary. More detailed emergency response actions may be outlined for critical components after the installation vulnerability assessments are completed. Ensure all Occupational Safety and Health Act (OSHA), EPA, and primacy state safety regulations are followed. Record all repair activities on the operating and damage report Form also included in Appendix G (reference 6). Public notification provisions should be addressed in the event of probable water supply contamination from line breaks.

f. COORDINATION WITH OTHER AGENCIES. Coordinate with other installation directorates [e.g., Installation Medical Authority (IMA), PA, police, and fire], USACHPPM - Water Supply Management Program (USACHPPM-WSMP), neighboring utilities, other military branches, Federal (if no state primacy), state, and local emergency/regulatory agencies to obtain

regulations, recommendations and/or assistance. Through coordination and pooling resources for the development of contingency plans, [installation], state, and local managers benefit (reference 5). Local emergency management programs are the heart of the nation's emergency management system (reference 14). When a disaster overwhelms local resources, state emergency management agencies take a leading role in coordinating responses, even those so major that Federal assistance is requested. The Federal Emergency Management Agency (FEMA), in turn, works closely with the states to provide valuable support. Most states follow very specific procedures to provide assistance. Organizations such as the National Rural Water Association and its state rural water associations, American Red Cross, and the Salvation Army may also be able to provide assistance at a governor's request (reference 15). Some of these and other organizations which may be able to provide assistance are already listed in Appendix D, Table 1 (Appendix A, reference 6). Initially, obtain basic information from local agencies on how they can help. Specifically request available information on preparedness and procedures for those disasters at which the installation is at greatest risk. Sample preparedness information that is available is shown in the Figure in Appendix H (reference 3). As the installation plan further develops, request additional information and draft or formalize written agreements, as necessary. Outline provisions of mutual aid on the Form also shown in Appendix H. Often a coordinated effort between state and local organizations and the installation can be provided for a multitude of procedures and operations, but none are more important than the following.

(1) Contamination Procedures. These procedures need to be addressed because contamination can occur from any number of natural, accidental, or intentional disasters. Ensure coordination with installation environmental and medical personnel in the development of procedures. Installation personnel should obtain and become familiar with the Installation Spill Prevention, Control, and Countermeasure Plan (SPCCP), Installation Spill Contingency Plan (ISCP), WHP (if it exists), and other appropriate emergency response documents as may be indicated in Army Regulation 200-1 (reference 16). Include these plans and MSDS in this section. Consider an emergency response actions sequence when discussing contamination with contributing organizations. Integrate their procedures into final installation emergency response actions. Consider procedures which include who notifies others and how, monitors for contaminants, provides back-up and increased monitoring, evaluates and decides corrective action (which includes for nuclear, biological, and chemical agents), coordinates with external experts (on-call 24 hours/day) when needed, and determines when the crisis is over. Find out what current literature and toxicological databases should be referenced. Most incidents may need to be dealt with on a case-by-case basis. When safety cannot be assured due to chemical or bacteriological contamination, the water supply for human consumption should be terminated (reference 17). Examples of actual basic corrective response actions to contamination are contained in the Figure in Appendix I. Positive pressure, buried plastic distribution systems were once thought to be impervious to contamination, but this is known to no longer be true. Certain contaminants actively permeate such piping systems (reference 18). As a result, these piping systems must be considered in cleanup and protective procedures.

(2) Personnel, Agency, and Public Notification Procedures. A written sequence of notification procedures should be outlined. Such an outline should include any required agency coordination, language required by regulation, and provisions for addressing questions from the public. The PA office should participate in the effort since they will probably be the only source of information for the public during an event. The EPA publishes guidance for public notification in a guide entitled "General Public Notification for Public Water Systems" (reference 19). Specific phone numbers provided only for media or priority customer use have been found to be useful. During the Washington, D.C. December 1993, drinking water crisis which resulted in a boil water advisory, a number of important lessons were learned. It was imperative [to] act quickly to assemble and coordinate all parties involved. It was necessary to quickly inform the public of the situation in order to take the necessary precautions against disease, that they be told what to do to protect themselves, that they be kept continually informed of any and all updates, and that above all else, the public be kept calm to prevent panic (reference 20). Integral to this type of effort is that these actions be coordinated with all necessary regulatory agencies. Ensure earliest possible notification of priority users, especially medical facilities and sensitive populations (dialysis and immunocompromised patients), if necessary. A sample installation notification sequence, which includes procedures, an EPA checklist, and a draft boil-water notice is shown in the Figure in Appendix J. Sample boil-water notices should be drafted ahead of time. An example of a sample initial news release is shown in Appendix J, Form 1 (reference 5). An example of a public water service shut-off notice is also shown in Appendix J, Form 2 (reference 6).

(3) Water Conservation/Alternate Sources and Procedures. List existing water conservation measures/alternate sources and associated notification and implementation procedures. The [IMA]/Preventive Medicine (PM) may require their prior approval and assessment of alternate water supplies (reference 21). In the absence of established policy, USACHPPM provides recommended policy and guidance for initiating and rescinding alternative drinking water supplies in response to on and offpost contaminations caused by Army activities (reference 22). At a minimum, verify the circumstances under which existing water conservation and alternate source procedures are initiated and ended. Appendix K, Figures 1 and 2 provide details of actual water conservation and alternate water supply plans. If possible, consider adopting applicable elements of the sample plans until details of a specific installation plan are decided. List all alternate sources and treatment including bottled water [must be from an approved source (references 23 and 24)], interties with neighbors, water purification, or dilution, if possible. Consider whether alternate sources are needed long-term or short-term. Consider novel alternate sources for water, such as milk, soft drink, and beer bottling facilities (reference 7); and for treatment, purification units from reserve and National Guard units. Check primacy states for potential water supplies since they may have established emergency plans for the provision of alternate water supplies (reference 5) in accordance with requirements of the 1974 SDWA. Ensure steps are clear on how and where the public should obtain alternate supplies. As the plan develops, list all steps needed to obtain and distribute alternate sources,

capacities of equipment, available non-potable sources (which have the potential for treatment during water shortages), etc.

(4) Availability of Additional Resources. Initially, find if a support network already exists for borrowing additional resources, such as water utility personnel, equipment, supplies, and power. After the initial installation inventory is conducted and the vulnerability assessments are completed, poll neighboring municipalities and organizations to discover and list personnel (including heavy equipment operators), tools, laboratory and repair equipment, spare parts, water resources, and supplies that may be borrowed during an emergency. Establish an agreement with local power companies for priority power (reference 25). Include emergency phone numbers and a means of 24 hour access to contacts.

g. PRIORITY SERVICE REQUIREMENTS. Solicit requests/justifications for priority service under emergency conditions. Installation personnel should request feedback on who needs priority service and what quantity, quality, and minimum pressure they need. Ask priority service customers if they have any other water sources or tanks. A good list of those who typically need priority service from civilian treatment facilities are shown in the Table in Appendix L (Appendix A, reference 10). Be aware that Army installation headquarters, communications, radar facilities, and other sensitive operations may also require priority service. Priorities depend on the installation's mission. Maintain a list as shown in the Form in Appendix L (reference 6) which also shows those facilities to be provided with priority service, points of contact, and phone numbers. For easy reference on water utility maps, highlight distribution lines and components which serve priority customers.

h. WATER USAGE ESTIMATES. Develop water usage estimates before a crisis to help ensure an adequate and swift response to save precious reserves and provide uninterrupted service. Compile basic information to include average, minimum, and maximum water usage (by season), and maximum fire flow requirements. For a basic approach, the system must be capable of supplying the fire flow specified plus any other demand that cannot be reduced during the fire period at the required residual pressure and for the required duration (reference 26). The fire flow is considered to be equal to the maximum daily demand... and often for periods of ten hours or more (reference 27). Contact the Directorate of Public Works (DPW) to obtain available information on capacities and fireflow designed into the water system. If design information is not available, obtain and use local fire codes for properly estimating water requirements. At a minimum, provide for fire flow for the required duration, regular consumption, and losses when evaluating the implementation of water conservation or alternate source measures. If necessary during an event, consider usage based on life safety, fire-fighting needs, priority service, public health, any mobilization, expected water conservation, and industrial/commercial needs. Consider dramatic life safety actions to avoid potential catastrophes, such as emptying a reservoir to prevent dam failure during an earthquake. With time and for disaster-specific plans and critical components, develop more accurate estimates of water losses, time to make repairs, water

demands, and expected storage capacity at crucial times during the crisis. See the Table in Appendix M (reference 28) to help estimate minimal water consumption during an emergency mobilization.

i. SECURITY AND INSPECTION. Starting today, at a minimum, initiate basic security and inspection procedures, if not already implemented. Physical and operational security are often the most effective ways of reducing incidence of crime (reference 7). Provide at least one barrier such that a vandal may not gain direct access to a component to either damage or contaminate it. This may only require locking the front door to the water treatment facility and the gates to wells. All potable water storage tanks should be covered (reference 4) and locked. A high level of protection can be engineered into an onsite facility, but the best protection may be enhanced vigilance (reference 8). Begin inspection procedures to ensure that the barriers are maintained and to detect evidence of tampering. Request security force and PM assistance in looking for abnormalities [i.e., evidence of forced entry, floating debris, dead flora/fauna in a raw water reservoir, and unusual colors or odors anywhere in the system (reference 8)] while they are engaged in routine activities. For further protection, ensure emergency cut-off valves are functioning. Also, consider the installation of valve, pump, and manhole [within six blocks of critical locations (reference 25)] locks, additional lighting, alarms, surveillance and intrusion detection systems, fire suppression equipment, and signage (reference 7). Consider more secure utility and hazardous material placement. Provide utility workers with identification cards to allow mobility in limited access disaster areas. Survey employees for weaknesses. List all current security controls and operations. Again, ensure water system information is not available to unauthorized persons. Although almost everyone would like to operate in an environment of trust, these basic precautions should be taken to prevent a potential emergency which could result in immeasurable damage and loss of life or necessary exhaustive precautions caused by a contrived emergency. It is much easier to employ basic security than to clean-up a catastrophe.

6. VULNERABILITY ASSESSMENTS.

a. GENERAL. The vulnerability assessments provide for an orderly summary and analysis of the potential impacts of disaster hazards on water system components and water supply. The vulnerability assessments are divided into two sections, the overall and the disaster-specific, which allows for impacts to be addressed in more detail.

b. OVERALL ASSESSMENT.

(1) Five-Stage Process. The overall vulnerability assessment is a five-stage process. First, probabilities of disasters and associated hazards with each event are evaluated. After considering the most probable and severe hazards, the utility should determine if people's lives or the system components are vulnerable to those hazards. After determining the vulnerabilities, assess the

impact on critical components on which the installation's greatest priorities rely. The key elements of the overall vulnerability assessment are (reference 3):

(a) Estimate the probability and magnitude of potential disaster hazards.

(b) Identify the major system components.

(c) Determine the effects of most probable or severe hazards on system components.

(d) Determine the performance goals and acceptable levels of service for the system.

(e) Identify the affected critical components which impact life and service goals (priority demand).

(2) The First Three Elements and The Last Element. These elements can be placed in a single overall vulnerability assessment matrix or table to make their analysis easier. A completed sample matrix (adapted from original source) is shown in Appendix N, Table 1 (Appendix A, reference 3). A blank overall vulnerability assessment matrix, listing most possible disasters and major components, is located in Appendix N, Form 1 (reference 3). This blank form also lists most possible disasters and major components, and is ready for completion.

(3) Goals - The Fourth Element. The fourth element is often the most difficult to evaluate since each event presents different and unique challenges to protect life and service. All that can be done until the actual event is to provide an estimation of needs for protection based on our goals of life safety, fire suppression, public health needs, and commercial or industrial uses. During the event, the water utility emergency operations commander will conduct an ongoing assessment to provide the most appropriate protective action. To start a basic and quick assessment, some utilities will simply identify (on maps) the critical distribution lines and components which provide priority service. These become the areas to be targeted for priority protective actions unless a threat to life exists. After the overall vulnerability assessment is completed, track critical impacted components on maps.

Always realize that vulnerability to one disaster may make the system vulnerable to others (e.g., a main break caused by an uprooted tree may lead to contamination). Consider impact of one component on another (low pressure may cause automatic cut-off of treatment unit). Be aware that vulnerability assessments for your area may have already been conducted. The USACHPPM-Pacific (USACHPPM-PAC) is a good resource for current Korean vulnerability assessments (reference 9).

c. DISASTER-SPECIFIC VULNERABILITY ASSESSMENT. The disaster-specific vulnerability assessment provides additional written details on damage severity, priority service

effects, type of damage, other results, and needed mitigation. A sample table and blank form, ready for completion, have been provided for that purpose in Appendix N, Table 2 and Form 2. To simplify transition from the overall to the disaster-specific assessment, use the electronic version of this plan. Copy columns of impacted components and information for disasters of concern, from the overall vulnerability assessment matrix, and paste them in the disaster-specific form for further analysis and evaluation.

7. DISASTER-SPECIFIC EMERGENCY RESPONSE ACTIONS.

a. GENERAL. Using existing resources and elements already obtained or developed, list the appropriate sequence of emergency response actions necessary to protect life, critical components, and service priorities. Start with the most important disaster event as determined by the vulnerability assessment. The following emergency response actions, adapted from a list developed by the AWWA (reference 3), are provided as a guide to help installations develop their own action sequence. For each step of the following actions, elements, from paragraph 5 of this information paper, which have the potential to be used are indicated.

b. DISCOVERY - MEANS OF ALERT OR DETECTION (Element 5a). Some emergencies will be real, but some may be false alarms contrived by a caller or due to monitoring failures. An important means of obtaining accurate information is from legitimate callers. Be aware that one disaster can trigger another with more dire consequences. Decide the appropriate protective response under a host of situations to include supervisory control and data acquisition (SCADA)/telemetry readings, weather warnings, high contaminant levels, detected chemical leaks, apparent sabotage, verbal warnings from a caller, unauthorized access, obvious damage from equipment failure or of unknown cause, accidents, routine inspection, or weather. Weather and flood warnings can come from a number of organizations which includes the National Weather Service, United States Geological Survey, state agencies, and the U.S. Army Corps of Engineers.

c. TYPE AND SEVERITY OF EMERGENCY [Elements 5a,c,e,f(1) and (3),g,h,i]. Analyze the type and severity of the emergency in order to make the best initial decisions for an immediate safe and effective response.

d. LIFE/SAFETY NOTIFICATION (Elements 5b,d,f,g). If possible, simultaneously initiate actions to prevent an immediate threat to lives (e.g., evacuation according to any needed plans) and notify the water utility emergency operations commander. Spill or local emergency response teams may need to be notified. Coordinate information for the public and the media through PA. List means (including alternate) of communication available. Log all communications and activities and maintain records (reference 29). If needed, set aside phones with separate numbers exclusively for contacting PA, personnel, emergency agencies, or family members.

e. PREPARATION PRIOR TO EMERGENCIES (Element 5d,f,i). If given lead time, implement preparation procedures. Determine if a backup EOC or employee shelters and food or sanitary provisions are needed. Decide if other employee assembly or reporting areas are needed. Is increased security needed, such as water utility worker identification in limited access disaster areas? Will a temporary public shelter require priority service in a new area?

f. PREVENT INJURIES/ADDITIONAL DAMAGE (Elements 5a through f). Make repairs or conduct temporary mitigation actions to prevent injury or further damage.

g. PERFORM EMERGENCY REPAIRS (Elements 5a through i). Perform emergency repairs based on priorities. List the sequence of procedures for the commander and others to include agency, emergency, personnel, information, inspection, laboratory, and equipment coordination; health advisories, agency and customer (and priority) notifications, water conservation/alternate source or treatment considerations, debris cleanup, component assessments, monitoring, and emergency repairs to meet the most immediate goals, and ensure priority service. Consider novel temporary operational approaches to ensure supply, such as temporary piping or systems (reference 10). Provide good communication channels between the emergency command, decision makers and field personnel. Outline personnel instructions which include special materials and tools, in as much detail as needed.

h. NOTIFY PUBLIC (Elements 5b,f). Notify the public on the event progress. Provide the public continual updates on any health advisories, service restrictions, water conservation, etc.

i. RECOVERY STEPS (Procedures to Restore Service) (Elements 5a through h). Complete most-urgent repairs in order of priority. With proper approvals, lift health advisories and service restrictions. Complete any permanent repairs, abandonment, replacement, or remediation.

j. EVALUATE RESPONSE ACTIONS. Continually evaluate emergency response actions during the event. Make necessary changes promptly. To ensure emergency response actions are current and followed, conduct the following as soon as possible after the disaster event.

(1) Evaluate and update emergency response actions or essential elements.

(2) Provide the necessary distribution of any updated emergency response actions and essential elements, and maintain a record of recipients.

(3) Ensure adequate training for personnel to quickly integrate the most recent changes in procedures.

(4) Note needed short- and long-term mitigation actions.

8. MITIGATION ACTIONS. Improve the preparedness and capability of the system as indicated by the deficiencies, especially those identified in the disaster-specific vulnerability assessment and in actual events. Establish a tracking system for necessary mitigation actions. Justify mitigation costs through comparison with estimated or actual losses from a disaster. Complete the following activities, as needed, which are adapted from a list developed by the U.S. Army Corps of Engineers (reference 30).

a. REDUCE THE VULNERABILITY OF THE SYSTEM.

(1) Optimize the efficiency through Water System Performance Evaluations.

(2) Increase strength, reliability, and control of supply, treatment, and distribution facilities through construction, redesign (including waterproofing electrical components), automation, or relocation. Provide for an optimal critical component design which addresses impacts from multiple hazards.

(3) Acquire necessary equipment to isolate parts of the system.

(4) Increase the stockpile of materials and supplies.

(5) Improve preventive maintenance especially for critical components (which includes regular inspections and testing).

(6) Ensure adequate monitoring, and give consideration to continuous on-line measurement of routine and biological parameters (reference 8).

(7) Implement wellhead and watershed protection, water conservation (which include leak detection surveys), and cross-connection control programs.

(8) Maximize resources of mutual aid (e.g., through neighboring system interties and replacement personnel).

(9) Develop auxiliary power sources and fuel supplies.

(10) Improve security procedures.

b. REQUEST PERSONNEL SHELTERS.

c. COMMUNICATIONS. Add communications, as required, which may include fixed and mobile phones, extra phone lines, computers, fax machines, radios, and pagers.

d. ACQUIRE ADDITIONAL REPAIR EQUIPMENT.

e. SKILLS AND SAFETY. Increase skills and safety of employees through increased training and cross-training.

f. IMPROVE EMERGENCY PROCEDURES.

g. ASSESS PLAN. Assess and update the plan at least annually, as a result of new additions, or as necessary. Ensure distribution of the plan to all participants.

9. ADDITIONAL INFORMATION. Additional information regarding Water Utility Emergency/Contingency Plans may be obtained by contacting the Water Supply Management Program, commercial 410-671-3919, fax 410-671-8104, DSN 584 or email chppm_dwater@chppm-ccmail.apgea.army.mil. This guide will be available for viewing in the near future on our web page at http://chppm0b.apgea.army.mil/dwater/index.html.

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APPENDIX A

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APPENDIX B - FORM

" "

POTABLE WATER
EMERGENCY/CONTINGENCY PLAN COVERSHEET

DATE:
FACILITY INFORMATION:
Location (street address):
City: State: Zip:
County: Phone number:

Latitude: ___degrees __minutes _seconds
Longitude: ___degrees __minutes _seconds

Prepared by:

_____(sign & date)
Name
Title

Reviewed by:

_____(sign & date)
Name
Title

_____(sign & date)
Name
Title

_____(sign & date)
Name
Title

_____(sign & date)
Name
Title

Approved by:

_____(sign & date)
Name
Title

APPENDIX C

NOTIFICATION REPORTS

FORM 1
EMERGENCY NOTIFICATION REPORT

Part 1 -- Facts Related to Emergency

1. Person or department calling in emergency _____
   Phone number/radio frequency _____ Date/time call received _____
2. Location of emergency
   Street and house/building number _____
   Other (approximate location, distance from landmark, etc.) _____
   _____
3. Condition at scene [check appropriate box(es)]
   - □ Escaping water: ___Seepage ___Free-flowing ___Gushing
   - □ Flooding: ___Roads ___Intersections ___Property ___Buildings
   - □ Erosion: ___Banks ___Foundations
   - □ Electrical power: Interruptions Total loss of power
   - □ Change in water quality: ___Taste ___Odor ___Color ___Clearness
4. Actual/potential damage
   Briefly describe the situation _____
   _____
   _____
5. Access restrictions, if any _____
   _____
6. Assistance already available (who, what they are doing, etc.) _____
   _____
   _____
   _____

Part 2 -- Assess Emergency

1. Personnel analyzing emergency _____
   _____
2. Reported results of investigation _____
   _____
3. Time assessed _____

Part 3 -- Emergency Action Taken (Refer to emergency response plan.)

1. Immediate action taken [if emergency response plan is used, note page(s)]. _____
   _____
2. Is immediate action □ Permanent □ Temporary
3. Was an emergency crew dispatched? □ Yes □ No
   Time arrived on scene _____
4. Note all other actions that will be necessary to bring the facility back in line_____
   _____
   _____

(form date: 2/98) *Adapted from source: Washington State (1982).*

(attach emergency-related notifications/reports/records)

FORM 2
SUPPLEMENTAL CHEMICAL INCIDENT NOTIFICATION REPORT

Identity of contaminant material: _____

Manifest/shipping invoice/billing label _____

Shipper/manufacturer identification _____

Container type _____

Placard/label information _____

Railcar/truck 4-digit identification number _____

Nearest railroad track intersection/line intersection _____

Characteristics of material, if readily detectable (e.g., odor, flammable, volatile, corrosive) _____

Present physical state of material (gas, liquid, solid) _____

Amount already released _____

Amount that may be released _____

Other hazardous materials in proximity _____

Whether significant amounts of the material appear to be entering the atmosphere, nearby surface water, storm drains, or soil _____

Direction, height, color, odor or any vapor clouds or plumes _____

Weather conditions (including wind direction and speed) _____

Local terrain conditions _____

Personnel at the scene _____
(form date: 2/98)

FORM 3
THREAT EVALUATION INFORMATION FORM

To be used at the time, or immediately following the receipt, of a threat of contamination or other disruption to the water system.

Date threat was received: _____

Time: _____

Key words in threat:_____
_____
_____
_____

(Tell caller that you need to be as complete as possible in his/her message in order to accurately perceive the nature of the threat.)

Perpetrator's Profile:
Sex: Male____ Female____ Not Sure____
Age: Adult____ Teen_____ Child_____ Not Sure____
Voice: Normal_____ Muffled_____ Slurred_____
Calm_____ Nervous_____ Excited_____
Is there a foreign accent? Yes___ No____

Background noises (if any):_____
_____
_____

Does the caller claim an affiliation with a particular organization?
Yes_____ No_____ If so, what organization?_____
_____
_____

Name of person receiving threat:_____
_____

Location at time threat was received:_____
_____
_____
_____

(form date: 2/98) *(Based upon recommendations from the Washington Metropolitan Area Toxic Threat Response Manual.)*

APPENDIX D

KEY PERSONNEL AND CONTACTS

FORM 1
WATER SYSTEM PERSONNEL -- EMERGENCY CALL-UP LIST

Disaster Event and Date _____

Last Personnel Update on _____ by _____. Next Update Needed (1/yr min) by _____.

For each category, in ranking order list water system personnel responsible for making decisions in specific emergency situations.

Track Contact (attempt call, mark time; if contact, circle time)	Category	Name/Address	Title	Telephone Work/Pager	Telephone Home (include response time)	Major Responsibility and Expertise
	Quality and treatment	1. 2. 3. 4.				
	Source water	1. 2. 3. 4.				
	Storage	1. 2. 3. 4.				
	Distribu-tion	1. 2. 3. 4.				
	Pressure and pumping facilities	1. 2. 3. 4.				

(form date: 2/98) *Adapted from source: Washington State (1982).*

FORM 2
KEY PERSONNEL & CONTACTS
Disaster Event and Date _____

Last Data Update on_____ by _____. Next Update Needed (1/ year) by_____.

Track Contact (each attempt, call, mark time; if contact, circle time)	Positions/Titles/Offices	Name	Telephone Work/Pager	Home
	COMMAND			
	Installation Commander			
	Installation Sergeant Major			
	DPW			
	UTILITIES			
	Chief			
	Engr Support Asst			
	Chief, Mech Br			
	Envr Specialist			
	Plumbing Section			
	Water Facility Section - refer to emergency call-up list			
	Water Laboratory			
	Sewage Plant Section			
	Exterior Electric Section			
	Interior Electric Section			
	BUILDINGS AND GROUNDS DIVISION			
	Chief			
	Engr Support Asst			
	Maint Mech Foreman			
	FIRE STATION			
	Chief			
	Admin/Alarm Room			
	POLICE			
	SAFETY			

	MEDICAL			
	Emergency/ambulance			
	Hospital			
	Preventive Medicine			
	PUBLIC AFFAIRS			
	STAFF DUTY OFFICER			
	POWER PLANT			
	EMERGENCY RESPONSE TEAMS			
	Installation			
	Federal/State/Local			
	CHPPM - Water Supply			
	EPA/STATE/LOCAL			
	Health			
	Water			
	WARNING/INFO. AGENCIES			
	National Weather Serv.			
	US Geological Survey			
	US Army Corps of Eng.			
	PRIORITY CUSTOMERS - refer to priority customer call-up list			
	OTHER KEY OFFICES (List other key personnel involved in planning and repair/restoration of water supply during a water emergency)			

(form date: 2/98) *Adapted from source: USACHPPM-PAC (1996).*

FORM 3
EMERGENCY COMMUNICATIONS MESSAGES LOG*

Date	Time In	Out	To/From	Type of Message	Message

* To be maintained by water system personnel.
(form date: 2/98) *Source: Washington State (1982).*

TABLE 1
SUPPORT CALL-UP LIST

Suppliers

- pipe, valve, and fitting vendor
- pipe bedding and concrete
- lumber yard
- chemicals and chemical feed pumps
- shoring
- pumps and electrical
- hardware store
- fuel
- tires
- signing
- heavy equipment
- rental center
- all contract vendors (emergency number can be a provision of the contract)

Contractors

- excavation
- general contractor
- electrical
- pump
- water hauler
- communications
- computer
- telemetering
- traffic control

Agencies

- wastewater/storm water utility
- neighboring utilities
- emergency services
- safe drinking water program
- laboratories
- Red Cross
- ham radio club
- electrical/telephone utility
- fire department

Special Contractor/Equipment List

- concrete saw
- auxiliary power (pumps, garage, office computer, and communication)
- portable lights
- alternate transportation
- catering/restaurant
- showers
- warm/cool resting place
- chain saws
- sump pumps
- chlorine test kits

Source: Washington State (1982).

TABLE 2

OTHER DEPARTMENTS/AGENCIES TO NOTIFY

City Hall

- city manager/administrator
- elected officials
- fire department/district
- police department/sheriff
- wastewater/storm water utility
- street/road/highway department
- engineer
- insurance/safety officer
- dispatcher

Other

- one-call system
- emergency services
- local/state health departments
- newspaper (news desk and traffic reports)
- radio (news desk and traffic reports)
- television (news desk and traffic reports)

Priority-Service Lists That Should Include Your Utility

- wholesale supplier
- electric utility
- telephone utility
- sewer utility
- emergency-response center
- chemical supplier
- fire department/district
- hazardous-material spill response

APPENDIX E

SAMPLE WATER TREATMENT PROCESS DESCRIPTION

SAMPLE
WATER TREATMENT PROCESS DESCRIPTION

1. Raw Water Supply.

a. The raw water supply for ___ is obtained from the ___ square mile ____ watershed. The water is of good quality and is considered soft mountain stream water. Artificial storage of water is provided by __ Lake (capacity __ mg), __ Lake (capacity __ mg) and __ Lake (capacity __ mg). This supply is supplemented from the ____ Lake, according to an agreement with _____.

b. The safe yield of the total supply system is ____ million gallons per day (mgd). Impounding water behind dams promotes the growth of algae for which corrective copper sulfate treatment is provided.

2. Transmission to Post.

a. The __ intake transports raw water by gravity through an 8-year-old, ___ inch cast iron pipe. The water flows __ miles to __ Lake for storage on the main post. Capacity of the __ inch line is approximately __ mgd after cleaning.

b. __ Lake has a capacity of __ million gallons with a usable capacity of __ million gallons. The intakes have spillways almost level with each other and __ feet higher than the __ Lake spillway elevation of __ feet. __ Lake is the direct source of __ Water Treatment Plant (WTP) located adjacent to the Lake. The __ WTP went into service in 19__. A diagram of the __ WTP is provided at page (not included).

3. __ Intake House.

a. A small intake station has __ sluice gates at elevations of __ ft. and __ ft. Depending on the quantity of raw water in __ Lake, water can be withdrawn through any gate.

b. Fine screen (__ inch) mesh over the __ sluice gate openings prevent leaves, sticks, fish and other debris from entering the WTP.

4. Mixing Chamber and Flocculator.

a. The mixing chamber is a small tank where chemicals are mechanically mixed with water before entering the flocculator. The flocculator is a chamber consisting of slowly revolving, vertically orientated, paddles. Chlorine and aluminum sulfate (alum) machines, to feed these two chemicals, are located here. Chlorine is used for disinfection. Alum is used for flocculation and coagulation. Alum reacts with natural alkalinity to form aluminum hydroxide, a sticky gelatinous

substance. The alkalinity is diminished and the carbon dioxide increased, a condition that is corrected after filtration. Alum also removes color, which is a colloid of the humic acid type, originating from decayed organic matter.

b. When water enters the flocculator chamber, a "pin-head" floc has formed. The revolving paddles cause these "pin-heads" to collide, forming larger particles that will sink more rapidly in the settling basins.

5. Accelator.

a. A circular treating unit known as an accelator, is a radial up-flow tank with a 1- hour detention period that has a recirculating device to mix newly formed alum floc with existing alum slurry. It can deliver either to the settling basins or directly to the filters (although the latter is not done). This unit is equipped with chlorine, alum and carbon feed machines.

b. The functions of the mixing chamber and settling basin are intended to be combined in the accelator. By means of baffles and gentle pumping, alum slurry is kept in a state of revolution and the raw water, with newly formed alum floc, is added. In the outer chamber or clarifier section, a slurry blanket is formed and the water must rise vertically from this blanket to get out. This produces a set of physical conditions that frees the water of most of the suspended material. sludge is generally removed at the rate of formation, by adjusting a time switch which operates the sludge pump at 15 minute intervals. The alum is applied to the raw water entering the accelator. Although the unit produces good results, it does not remove enough of the suspended alum floc to permit direct application to the filters. The effluent therefore flows into a settling basin.

6. Application of Pre-Chlorination and Carbon.

a. According to local experience, the best results are obtained by allowing the alum to perform its functions before adding the chlorine. The chlorine is therefore applied to the water entering the settling basins. Chlorine forms hypochlorous acid, hydrochloric acid and oxygen. These compounds act to kill bacteria. The chlorine feed is adjusted to keep 0.10 ppm free chlorine in the water leaving the settling basins.

b. Activated powdered carbon is used only when the raw water contains taste and odor producing substances which have resisted removal by the normal process. It is applied to the water in the settling chamber of the accelator.

7. Sedimentation.

a. Sedimentation consists of two settling basins. Basin 1 has a capacity of __ gallons with a detention time of ___ hours. Basin 2 has a capacity of ___ gallons with a detention time, also, of ___ hours.

b. The settling basins provide time for completing chemical reactions and remove most of the impurities by sedimentation. The descending floc "sweeps" turbidity and bacteria down with it. The sludge is removed two or three times a year.

8. Filtration.

a. Filtration consists of ___ rapid sand filters. Each are ___ft and are rated at ___ gallons per day. _____ filters are automated, ___ operated hydraulically and ___ operated manually.

b. A small amount of floc remaining in the water leaving the settling basins, coats the sand surface of the filter. This is sticky and strains out remaining bacteria and suspended particles. A dense mat builds up and finally blocks the flow enough to warrant cleaning. Cleaning is accomplished by pushing water up through the sand and washing the dirt into the sanitary sewer.

9. Filtered Water Dosing Pits.

a. The dosing pit provides a place where the filtered water can receive chemical treatment before entering the clearwell and going to the consumer. It is baffled so water is uniformly dosed and so that precipitates that form can settle without passing into the water system.

b. A small dosing pit is used for applying soda ash, fluoride and chlorine to filtered water. Soda ash and fluoride feeders are located between the settling basins adjacent to the chemical storage space above the Number __ settling basin. They are dry chemical machines with solution tanks. The solutions flow to the dosing pit through gravity. The chlorine feeder is on the floor above the dosing pit.

10. Soda Ash, Fluoride, Chlorine.

a. Sodium Carbonate (soda ash) is added to the filtered water to take up carbon dioxide by forming sodium bicarbonate. This eliminated the main cold water pipe corrosive element. Incidentally, the soda ash softens the water slightly by removing calcium sulfate, a byproduct of the alum reactions.

b. Because it costs less, lime is often substituted for soda ash. Lime proved unsuitable for the water treated at _____ because it failed to check corrosion in the cold water pipes and because it sludged out in the domestic hot water heaters. Lime also hardens the water, increasing soap consumption. The use of soda ash obviates the necessity of installing softeners for the boiler water at the utility or the water at the laundry.

c. The application of the fluoride ion was commenced for the benefit of dental hygiene. Sodium silicon fluoride is used to furnish this ion.

d. Chlorine is again applied to the water after it leaves the filters as the chlorine previously applied has been consumed. The feed is small and is intended to kill any bacteria that may have passed though the filters and to provide the water with power to resist further contamination.

11. Laboratory Control.

a. Daily chemical, bacteriological and physical tests are necessary to control the purification process. Samples of the raw, settled and plant tap waters are analyzed each day. In the bacteriological test, specific procedures are followed to detect the presence of coliforms, since this is considered evidence of sewage contamination.

b. To discover any changes taking place in the distribution system and to further measure the effectiveness of the treatment process, samples are collected from the user's taps. These samples are collected weekly.

12. Reports. The daily plant operating conditions, storage figures, consumptions, total water treated and results of all chemical, physical and bacteriological tests are kept at the WTP. An additional water system operating report is submitted to the ___ County Department of Health each month.

13. Storage. Normally the ___ WTP supplies water to the ___ and ___ water districts. The water districts are depicted on the diagram (not shown). The ___ and ___ Districts have the following storage capacities:

Facility	Capacity (gal)	Elev. Empty (ft)	Elev. Full (ft)
Tank 1	__	__	__
Tank 2	__	__	__
Tank 3	__	__	__
Tank 4	__	__	__
Tank 5	__	__	__
Total	__ gallons		

14. Distribution System.

a. There are approximately __ linear feet of pipes ranging in size from __ to __ inch diameter.

b. Additionally, there are __ fire hydrants located on __ for fire protection.

15. Pumping Equipment.

a. At __ WTP.

__ ea __ gpm, __ ft. head, __ HP motors for backwash.
__ ea __ gpm, __ ft. head, __ HP motors for __ level pumping.
__ ea __ gpm, __ ft. head, __ HP motors for __ level pumping.

b. At __ Pumphouse.

__ ea __ gpm, __ ft. head, __ HP motors for __ level pumping.
__ ea __ gpm, __ ft. head, __ HP motors for __ level pumping

16. Chemical Storage and Controls.

a. Warehouse space in the mixing chamber is sufficient to store a __ month supply of alum and soda ash. This is necessary to obtain economical prices and to ensure the plant maintains adequate quantities of these essential materials. The chlorine utilized is stored in __ pound cylinders.

b. A system of electrical transmitters, receivers and recorders, centralizing all tank, pumping stations and water meter readings are installed at __ WTP.

APPENDIX F
TABLE
SAMPLE EMERGENCY SUPPLIES AND EQUIPMENT LIST

1. The following equipment is available.

   a. DPW, Maintenance Division.

      1 ea Backhoes (JD-410)
      1 ea Front End Loaders
      1 ea Pump Trucks (1,700 and 2,800 gal)
      1 ea Vacuum Truck
      1 ea Jet Rodder Truck
      1 ea Road Graders
      1 ea 22 Ton Crane
      2 ea 8 Ton Dump Trucks
      Misc. Pumps and Generators

   b. Engineer Platoon.

      2 ea Bulldozer (D-7)
      1 ea Scoop Loaders
      1 ea 25 Ton Crane
      1 ea Backhoe (JD-410)
      1 ea Road Scrapers
      1 ea 5 Ton Dump Trucks
      1 ea 8 Ton Dump Trucks

   c. DOL, Transportation and Maintenance Division.

      10 ea 400 gal Water Trailers
      1 ea 1,000 gal Tanker Trucks

2. The following supplies are available.

   a. __ WTP.

      1 ea 150 gpm Gasoline Pumps
      1 ea 100 gpd Pumps for calcium Hypochlorite

   b. Supply Division.

      1 ea Repair Clamps, 411 to 2011
      1 ea Sections of Water Main, 411 to 2011

APPENDIX G

SAMPLE BASIC REPAIR PROCEDURES

FIGURE
SAMPLE BASIC REPAIR PROCEDURES

POWER OUTAGE

1. If a power outage affects WTP operations call the Central Power Plant, ext. __ and provide details of the facilities that have been affected.

2. Contact all Utilities personnel in Alert Roster (Appendix D).

3. Contact the __ County Department of Health if water service is interrupted for more than four hours (see Main Failure Procedures). Contact PM (see Appendix D) if interruption exceeds four hours.

4. Consider activating auxiliary pumps. Each water district pump station has a backup gasoline pump.

5. Contact the Military Police, ext. __ and the Fire Department ext. __ of any anticipated reduction in water pressure.

6. Determine if the Water Conservation Plan (Appendix K) requires implementation.

WATER STORAGE TANK FAILURE

1. Notify the WTP Foreman, ext. __ and the Chief of Utilities, ext. __.

2. Isolate the water storage tank from the distribution system.

3. Supply system from adjoining district or pump to district and open relief valve at water storage tank valve vault.

4. Institute water restriction program if required.

5. Disinfect repair and sample to ensure potability of effluent.

Water Supply Management Information Paper No. IP 31-020

DISTRIBUTION SYSTEM WATER MAIN FAILURE

1. Notify the WTP Foreman, ext. __ and the Chief of Utilities, ext. __.

2. Notify customers in the affected area of shut off by door to door or public address system. If this shut off affects 1 percent or more of the population for more than four hours, notify the __ County Department of Health at __. 1 percent equates to 20 people for the __ WTP and 30 people for the __ WTP.

3. Shut off area of break. Water system maps are located in buildings __ or __.

4. Notify Maintenance, ext. __ and Pipe Shop, ext. __ to excavate and repair leak.

5. If water service interruption will exceed 24 hours, provide potable water tank units to affected areas. Coordination with the Engineer Platoon to obtain "Water Buffalos." The Directorate of Operations and Logistics can obtain emergency supplies of bottled water if required.

6. The WTP personnel will disinfect replaced pipes according to the provisions of the American Water Works (Standard C651-92). Disinfection of the piping may involve two issues. To disinfect the fittings we will wash the pieces in a solution of sodium hypochlorite prior to installation. To disinfect the piping we will flush the pipe to remove gross material and until discolored water is eliminated. The disinfection of piping will necessitate introducing a solution of 300 ppm of chlorine with a contact time of 15 minutes. The line will be flushed until the solution is less than 1.0 ppm. The effluent will be collected and introduced into the sanitary sewer if practical. Workers shall observe sanitary technique.

7. Promptly notify MEDDAC and PM of location of leaks to allow for water sampling surveys.

FAILURE OF ___ INCH RAW WATER LINE
AT
_____ LINE

1. Notify the WTP Foreman, ext. __ and the Chief of Utilities, ext. __.
2. Shut off __ Lake intakes.
3. Open Blow-off at __ Road.
4. Notify Maintenance, ext. __ and Pipe Shop, ext. __ to excavate and repair the leak.
5. Operate the __ WTP at a filtration rate of __ MGD.
6. Increase filtration rate at the __ WTP to supplement the __ area system from the _____ supply.
7. Institute water restriction program if required.
8. Disinfect and repair according to AWWA Standard C-615-92.

FAILURE OF ____ INCH RAW WATER LINE
AT
_____

1. Notify the WTP Foreman and the Chief of Utilities.
2. Shut off the __ and __ pumps.
3. Notify Maintenance and Pipe Shop to excavate and repair the leak.
4. Increase filtration at the __ WTP.
5. Supply all districts from the __ system via remote pumping stations.
6. Institute water restriction program if required.
7. Disinfect and repair according to AWWA Standard C-651-92.

FORM
OPERATING AND DAMAGE REPORT
Event and Date and Time_____

This report must be filled out in detail and turned in. It must be signed by the responsible foreman and supervisor on completion of repair/emergency.

Part 1 -- General Information

1. Date and time water system became aware of break or problem _____
2. Location of break or problem _____
3. Person or persons who notified water system of break or problem _____
Position(s) _____
4. Location and custody of book, card, memo, etc., containing information relative to this report _____
_____

Part 2 -- Pre-Action Information -- Assessing the Emergency

1. Time/date crew arrived on scene _____
2. Names of crew persons at scene _____
3. Nature of problem and/or cause of break. If unknown, state probable cause and detail facts supporting conclusions _____
_____
4. What damage was done? _____
5. What damage was done to adjacent property?_____
_____

Part 3 -- Emergency Action Taken

1. What emergency action(s) was taken to control situation at the scene? _____
_____
_____
_____
_____
2. Names of crew persons making emergency repairs _____
_____
3. Time/Date emergency repairs were made and service was restored _____
_____
4. Materials used for repair _____
_____
5. Is further action needed? If so, explain _____
_____
_____
_____
_____
_____
_____

Part 4 -- Supplemental Information

1. If negative or positive pressure or quality problem, what disinfection/bacteriological sampling procedures were followed? _____

_____

Is further action needed? Yes____ No____ Action _____

2. Were water quality samples taken?

Yes____ No____

Parameter	Date	Results

3. Were any photos taken? Yes____ No____ By whom? _____
4. Size and location of valves operated or work necessary to effect shutdown (diagram) _____

_____

5. Size, kind, type, pressure rating and/or class pipe appurtenance_____

_____

6. Date of installation_____ Life expectancy_____
7. Date of last inspection of pipe or appurtenances _____
8. Is main subject to excessive pressure or pressure changes? _____
9. History of prior trouble within_____feet and dating back to_____
10. Present condition_____
11. Condition and type of joints_____
12. Type of soil in ditch and characteristic of ground cover around existing water main_____

_____

13. Depth of pipe (top of pipe to street surface)_____
14. Size of hole in street_____
15. Type and thickness of street surface_____

_____

IMPORTANT: WHERE IT APPEARS THAT DAMAGE CLAIMS MAY ARISE, FILL OUT AND ATTACH SUPPLEMENTARY SHEETS WITH ALL INFORMATION POSSIBLE AND DRAW A DIAGRAM ON SEPARATE SHEET SHOWING AS MUCH DETAIL AS POSSIBLE, LOCATION, AND ADDRESS OF DAMAGED PROPERTY.

Crew Leader _____ Supervisor_____

(form date: 2/98)

APPENDIX H

EMERGENCY SUPPORT INFORMATION

FIGURE 1. SAMPLE PREPAREDNESS INFORMATION

PREPAREDNESS & PROCEDURE

The hurricane season in South Carolina begins each year on June 1 and ends November 30. Since 1900, 146 tropical storms or hurricanes have passed near enough to significantly affect some portion of the state. On the average, there are about three storms every two years, with the highest probability of a storm affecting the state occurring in late summer. Even at minimum force, these tropical storms are capable of inflicting major property damage to coastal and inland regions of the state.

The sudden surge of high water that accompanies a hurricane passage, called storm surge, is usually the greatest cause for the loss of life during a hurricane passage. The storm surge associated with weaker storms may be only a few feet, but may be as high as 15 or 20 feet or more during major hurricanes.

Because they are guardians of public health, water plant operators need to be prepared for emergencies associated with this seasonal hazard. It is imperative that citizens be protected from the spread of waterborne disease both routinely and during emergency situations.

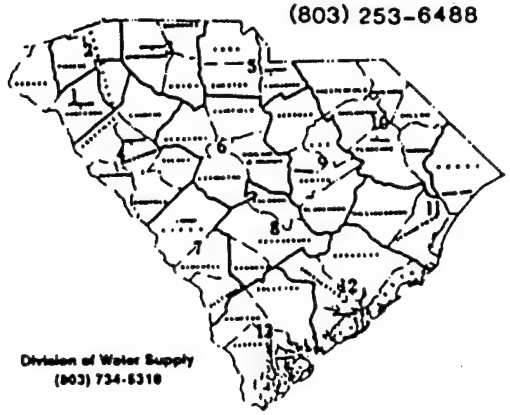
The following precautionary measures should be followed by persons responsible for safeguarding public drinking water facilities:

Before Storm

1. Check thoroughly all auxiliary and standby equipment. It is essential that this equipment function properly during emergency conditions. If possible, equipment should be automatically controlled to ensure operation if evaluation is necessary.
2. Stock adequate fuel supplies to operate auxiliary equipment for a 10 to 14 day period. An acceptable alternative is to make short term contracts with suppliers to hold fuel in reserve during the hurricane season.
3. Stock spare parts which are critical to the operation of the plant, wells or auxiliary equipment.
4. Maintain in good repair all mechanical equipment at water plants and wells, including booster pump stations.

S.C. Department of Health and Environmental Control
Environmental Quality Control District Offices

24-Hour Emergency Number
(803) 253-6488



Division of Water Supply
(803) 734-5310

Area	District	Telephone
1	Appalachia I	260-5569
2	Appalachia II	241-1090
3	Appalachia III	596-3800
4	Upper Savannah	223-0333
5	Catawba	285-7461
6	Central Midlands	737-7015
7	Lower Savannah I	648-9561
8	Lower Savannah II	648-9561
9	Wateree	778-1531
10	Pee Dee	662-3522
11	Waccamaw	448-1902
12	Trident	554-5533
13	Low Country	522-9097

5. Stock sufficient supplies of chlorine or hypochlorite and other necessary treatment chemicals to carry the system through a 10 to 14 day period.
6. If continuous chlorination is practiced then it is advisable to slightly increase the dosage of chlorine to insure a slightly higher chlorine residual within the distribution system.
7. Keep all ground storage reservoirs and elevated tanks as near to full capacity as possible upon receiving hurricane warnings. In the event of imminent landfall, provisions should be made to valve off those tanks and distribution lines located on barrier islands or in areas where breaching of waterlines is possible. An updated distribution map showing the location of all valves should be maintained.
8. Tape or board-up windows and tie down or secure any supplies or materials to prevent them from becoming airborne during the hurricane.
9. Know emergency procedures and emergency interconnections with nearby public water systems. Frequent communications with adjacent utilities in case of a mutual need is critical to the welfare of both your community and neighboring ones.
10. After hurricane warnings are received notify the Department of Health and Environmental Control (DHEC) when emergency procedures have been completed. This should be done by calling the District Director of the local Environmental Quality Control (EQC) Office. The EQC office should be made aware of how and where to contact persons in charge during emergency conditions.

After Storm

1. Survey all damage and make sure all water is being properly treated once hurricane warnings have been lowered or normal services are restored. Any areas where contamination of the water system may have occurred should be reported immediately to the local EQC office so bacteriological and/or chemical samples can be taken and analyzed.

2 Following a storm which significantly impacts an area where extended power outages have occurred, DHEC will be monitoring all public water systems. Advisories will be issued including boil water notices when necessary, as information becomes available.

3 In the event that it becomes necessary to safely disinfect the water at the customers tap, the following procedures can be used for safely disinfecting water for potable use:

DISINFECTION BY HEAT

A. Strain water through a clean cloth into a container to remove any sediment or floating matter. If water is clear, omit this step.
B. Boil the water vigorously for at least one FULL minute.
C. After allowing the water to cool, it is ready to use. If desired, a pinch of salt added to each quart of boiled water, or pouring it back and forth from one clean container to another several times, will improve the taste.

CHEMICAL DISINFECTION

Use liquid chlorine laundry bleach from the home laundry or grocery store. Do Not use a bleach that has a fragrance or scenting agent, like a lemon scent. Read the label to find the percentage of chlorine available then follow this table:

Available Chlorine	Drops To Be Added Per Quart**	
	CLEAN WATER	CLOUDY WATER
4 to 6 percent *	2	4
7 to 10 percent	1	2
If not known	10	20

*Common household chlorine laundry bleach (Clorox, Purex, etc.)

**1 teaspoon equals approximately 100 drops.

A Mix thoroughly by stirring or shaking water in container.
B Let stand for 30 minutes.
C. A slight chlorine odor should be detectable in the water; if not, repeat the dosage and let stand for an additional 15 minutes before using.
D. Water is now safe to use.

4. Any sustained damage to the water system should be immediately reported to the local EQC office. Reports concerning any minor damage should be reported within a few days or as soon as possible after the hurricane. Let the local district offices know if assistance is needed from the Department of Health and Environmental Control (DHEC).

Your local DHEC representatives will be working closely with Emergency Preparedness officials to respond to your needs following a hurricane or another disaster.

Please maintain and update your Emergency Preparedness plan as needed. Get to know your local DHEC representatives and local Emergency Preparedness director. If you have any questions, please contact the appropriate EQC district office (see map) or the Water Supply Division, located in Columbia.

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South Carolina Department of Health and Environmental Control
Division of Water Supply
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Columbia, S.C. 29201
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Division of Printing, Graphics and Photography

Hurricane Preparedness & Procedures

Water Facilities

Hurricane Information

APPENDIX H - FORM
EMERGENCY SUPPORT CALL-UP LIST

Disaster Event and Date _____

Last Personnel Update on _____ by _____. Next Update Needed (1/yr min) by _____.

The following agencies/organizations have agreements with this water system to provide assistance in an emergency upon request.

Track Contact (attempt. call, mark time; if contact, circle time, go to log)	Support Type (examples listed below)	Company/Agency Name and Address	Contact Name and Title	Telephone Work/Pager	Telephone Home (include response time)	Provisions
	Treatment Equipment and Supplies					
	Water source					
	Public Notification					
	Repair Equipment and Personnel					
	Backup Power					

(form date: 2/98)

APPENDIX I

SAMPLE CONTAMINATION CORRECTIVE ACTIONS

FIGURE
SAMPLE CORRECTIVE ACTIONS FOR
CONTAMINATION OF THE WATER SUPPLY SOURCE
AND DISTRIBUTION SYSTEM

1. Corrective actions to resolve contamination are delineated below:

a. In the case of a source water threat (raw water), immediately shut down the draw of water from the identified source. If the source of contamination is unknown then all sources shall be isolated and considered suspect. Utilize water supplies in storage until more information from testing is available.

(1) Long Term Threat. Isolate the water source, institute Phase II of the Water Conservation Plan (Appendix K, Figure 1), and attempt to remove the source of contamination and explore alternative water supply procedures.

(2) Short Term Threat. Isolate the water source, institute Phase I of the Water Conservation Plan and shift distribution to unaffected plant.

(3) Chemical Threat. Isolate source or shut down plant, survey for fish kill, monitor pH. Develop procedures to characterize, evaluate, resole, mitigate and monitor the nature and extent of the potential and/or actual contamination. Procedures would be on a case by case basis, depending on the individual situation. Contact USACHPPM for assistance. Consider damage to WTP and initiate procedures listed in paragraph la(1) and (2) above as required.

(4) Biological Threat. Increase chlorine residuals to purge the system.. While executing this, we will use a testing program based on the sites of contamination to trace the contamination source and then we will take corrective actions. Contact USACHPPM for assistance. Consider damage to WTP and initiate procedures listed in paragraph la(l) and (2) above as required.

Remove the source of contamination and disinfect the raw water line, if necessary. If the contaminant meets state effluent limitations, the discharge may be introduced into the storm sewer system. If the contaminated effluent needs treatment, accumulate the discharge and introduce it into the sanitary sewer system as appropriate. Workers shall observe sanitary technique.

b. Handle contamination of treated water distribution lines in a similar manner as that for source contamination. Isolate the distribution line and initiate an investigation to determine the cause of contamination.

(1) Sample outward from the WTP, through the distribution system, to the user's taps to identify the extent of contamination.

(2) Disinfection of the line may involve two issues. Disinfection of fittings involves washing the pieces in a solution of sodium hypochlorite prior to installation. The disinfection of piping will be accomplished according to AWWA standard C651-92. Flush the line until discolored water is eliminated. Collect the effluent and introduce it into the sanitary sewer if practical. Workers shall observe sanitary technique.

c. Contamination of potable water lines through cross-connection will require the immediate isolation of the appropriate lines. This is accomplished by valving off the building or section of piping. If contamination continues to spread throughout the system, further isolation would be warranted. Alternate water will be provided according to Appendix K, Figure 2, and notification may be required as stipulated in Appendix J.

d. If contamination of distribution lines cannot be resolved within 24 hours, the procedures of Appendix G will apply. We will isolate the applicable distribution lines and provide potable water through alternate means. Reporting requirements are outlined in Appendix J.

2. Contamination in sources or raw water lines affecting only one plant will permit shifting of operational demands to the unaffected WTP. Both plants will shut down if the source of contamination is unknown (e.g., terrorist threat) or if contamination is confirmed in sources that supply both plants.

3. Testing, to evaluate the threat, shall be conducted utilizing the assets available from WTP, MEDDAC and PM personnel.

4. Notify the served population and the _____ County Department of Health upon confirmation of contamination in accordance with Appendix J.

APPENDIX J

SAMPLE NOTIFICATION PROCEDURES

FIGURE
SAMPLE NOTIFICATION PROCEDURES

1. The _____ State Sanitary Code specifies mandatory reporting and notification requirements for various water related incidents. _____ will coordinate with the _____ County Department of Health to ensure the method and content of required notifications satisfy the intent of the regulation; to ensure the public's safety. Information concerning public notification requirements can be found in the EPA's "Public Notification Handbook for Public Water Systems" (EPA Publication 570/9-89002).

2. A checklist to prepare notices is located on page J-3. This guidance was derived from the "Public Notification Handbook for Public Water Systems."

3. Specific notification formats are specified in the "Public Notification Handbook for Public Water Systems" and can be distributed through the following media:

   a. Mail.

   b. Hand delivery.

   c. Posters.

   d. Newspaper.

   e. Radio and Television announcements.

4. The following incidents require public notification and state/county coordination.

   a. Confirmed water contamination.

   b. Service interruption.

   c. Drought alert.

   d. Nuclear release.

5. The following procedures are specified for these incidents.

   a. For confirmed contamination of the water supply.

      (1) PA will provide notification to users through internal and external media as appropriate.

      (2) PM shall contact the __ County Department of Health, at __, to coordinate published notices. PM will coordinate release of approved notices with PA.

      (3) A sample notice for E. coli contamination is provided at page J-4.

b. For Service Interruption.

(1) Interruption must be greater than 4 hours or affect more that 1 percent of the people (20 people at __ WTP or 30 people at __ WTP).

(2) PM shall contact the __ County Department of Health, at __, to initiate mandated reports.

(3) PA shall provide updated information to the __ community as required.

c. For a Drought Alert.

(1) PA shall notify the __ community concerning the alert and associated restrictions.

(2) Utilities shall provide information to the PA to support this requirement.

(3) The DPW shall request Military Police assistance in enforcing water restrictions.

d. Nuclear Release.

(1) Reports and information will be released from the Directorate of Operations, Plans, and Security.

(2) PM will notify the __ County Department of Health if the __ and __ WTPs are shut down.

GENERAL NOTIFICATION CHECK LIST

1. Provide a clear and readily understandable explanation of the violation.
2. Include information about any potential health effect.
3. Provide information about the population at risk (e.g., infants, the elderly).
4. Provide information about the steps being taken to correct the problem.
5. Include information about the necessity of seeking alternative water supplies, if any.
6. Include any preventative measures that should be taken until the violation is corrected.
7. Be clear and conspicuous.
8. Do not use unduly technical language.
9. Do not use unduly small print. This is particularly important for newspaper notices.
10. Do not create problems that frustrate the purpose of public notification. Do not underplay the seriousness of the situation nor create undue alarm.
11. Include a point of contact within DPW.

Sample

Contamination Notification

for E. coli

The __ State Department of Health sets drinking water standards and has determined that the presence of E. coli is a serious health concern. E. coli are generally not harmful themselves, but their presence in drinking water is serious because they usually are associated with sewage or animal wastes. The presence of these bacteria in drinking water is generally a result of a problem with waste treatment or the pipes that distribute the water, and indicates that the water may be contaminated with organisms that can cause disease. Disease symptoms may include diarrhea, cramps, nausea and possibly jaundice, and associated headaches and fatigue. These symptoms, however, are not just associated with disease-causing organisms in drinking water, but also may be caused by a number of factors other than your drinking water. The ____ State Department of Health has set an enforceable drinking water standard for E. coli to reduce the risk of these adverse health effects. Under this standard all drinking water samples must be free of these bacteria. Drinking water that meets this standard is associated with little or none of this risk and should be considered safe. State and local health authorities recommend that consumers take the following precautions:

All tap water for human consumption should be boiled for at least 2 minutes, or add <u>two</u> drops of liquid bleach disinfectant such a "Clorox" or four drops of tincture of iodine to one gallon of water, and let stand for 30 minutes before drinking.

Another alternative is to drink bottled water.

Individuals who have symptoms described in the above <u>Boil Water Notice may</u> wish to seek medical attention. Please take the above steps to protect your health until further notice.

FORM 1
SAMPLE INITIAL NEWS RELEASE FORM
(for distribution to previously identified television, radio, and newspaper personnel.)

The following substance has been detected in the _____ system:

It is vital that all residents in the _____ area observe the following water use restrictions until further notice:

The characteristics and potential health hazards associated with this contaminant are as follows:

City and water system personnel are taking the following steps to address the problem:

For further information please contact _____ at this phone number: _____. A press conference is scheduled for _____ to be held at _____. News updates will be provided as additional information becomes available.

Attached is a copy of an information sheet which provides details concerning the physical plans, organization structure, and function of the _____ water system.

Time: _____ Date: _____

Signed: _____

Title: _____
(form date: 2/98)

FORM 2
WATER SHUTOFF NOTIFICATION

The _____ water system will be turning the water off in your area in order to make necessary repairs to the system.

Area to be shutoff: _____
_____
_____
_____
_____

Date(s) and Time(s) of shutoff: _____
_____
_____
_____

Reason for shutoff: _____
_____
_____

Date of notice: _____

If you have any questions about the above information, please call _____

(form date: 2/98)

APPENDIX K

SAMPLE WATER CONSERVATION PLAN AND ALTERNATE WATER SUPPLY AND DISTRIBUTION PLAN

FIGURE 1
SAMPLE WATER CONSERVATION PLAN

1. Fort __ will utilize the __ State rule as a basis for reservoir drought stage determination.

2. Based upon analysis of available reservoir water supply we have calculated a usable volume of __ million gallons (MG). This takes into account the actual amount of water that can be retrieved by the current water distribution system, not the total capacity of the reservoir systems.

3. Water level measurements are conducted daily at Lakes __, __, and __. The diagrams at pages E-5 to E-7 (not shown) depict analytical data concerning the usable water volume at these lakes. These records are reviewed and maintained at the __ WTP by the Plant Foreman. These daily readings are used to calculate total volume of usable storage and the percentage of usable water. This will determine when __ should institute the following water restrictions listed on pages K-2 and K-3. The action levels for these phases are listed below:

   a. Phase I — Drought Alert; 50 percent usable storage.

   b. Phase II — Drought Warning; 40 percent usable storage.

   c. Phase III — Drought Emergency; < 30 percent usable storage.

4. In the event of a major leak, system failure, or excessive consumption beyond the capacity of the system to respond, the DPW will initiate emergency water restrictions. These restrictions are listed on page K-3. These steps were chosen because of the large volume of water these activities consume. The DPW will determine which stage to implement based on reports of water loss determined by the Utilities Division. These measures will generally be temporary in duration.

5. Emergency water can be supplied with potable water trailers. Coordinate with Logistics to obtain and supply these "Water Buffalos." Logistics can obtain emergency supplies of bottled water if required.

6. Implementation authority for drought declarations and emergency water restrictions is the Installation Commander.

Phase I

- No serving water at clubs, snack bars or other restaurant type facilities except upon request of patron.

- No serving water in troop or cadet mess halls except upon request or self-help.

- No watering of the golf course except the greens.

- No washing of privately owned vehicles.

- No washing of paved surfaces (e.g., streets, sidewalks, stairs, astro-turf at __ Stadium, tennis courts).

- No use of air-conditioning by any system not employing air cooled condensers, cooling towers or evaporative condensers. Exceptions are the hospital and dental clinic.

- No watering of lawns, flower and vegetable gardens, landscaped areas, trees, shrubs or other outdoor plants. Exceptions are the __ and __. Minimum watering of newly planted trees and shrubs would be permitted to prevent loss.

- No use of water for ornamental purposes (e.g., fountains).

Phase II
(Additional to Phase I)

- No operation of the ice skating rink except for intercollegiate hockey season.

- No filling of indoor, outdoor or private swimming pools.

- No draining or refilling of indoor pools.

- No use of outdoor or private swimming pools.

- No use of fresh water to flush sewers or hydrants except when necessary for public health and safety.

- Complete ban on all vehicle washing except high cost vehicles (e.g., fire trucks).

Phase III
(Additional to Phase I and II)

- Water use limited to 50 gallons per person per day.
- No watering of golf course greens.
- No watering of any landscaping or athletic fields.
- Selective shutdown of public and family housing areas on a rotating basis, not to exceed four hours in duration (water hours). Exceptions are Buildings __ and __.

Water Emergency Restrictions

Stage I

- Suspend all lawn watering activities excluding golf course greens.
- Shut off water to outdoor swimming pools and __ Lake (summer). Suspend snow making (winter).
- Suspend use of showers in the gym.
- Restrict Operations at the Post Laundry. Logistics shall implement the provisions in Regulation __ to reduce the Laundry's water consumption by 25 percent.

Stage II
(Additional to Stage I)

- Mess and other dining facilities will utilize disposable plates and utensils, suspend use of linen table cloths, and modify menu items to restrict water usage (e.g., no soup preparation).
- Restrict domestic laundry to one load per day per family in housing and limit soldiers in barracks to one load per day.

Stage III
(Additional to Stage I and II)

- Mess and other dining facilities will adjust meal cycle to an A-C-A cycle (one MRE for lunch). Other restaurants onpost will suspend operations.
- Institute Phase III of the Drought Emergency declaration provisions.

FIGURE 2
SAMPLE ALTERNATE WATER SUPPLY AND DISTRIBUTION PLAN

1. Alternate Water Supplies.

a. City Water. Unfortunately, the city water may not be available in the event of a regional water shortage, or if the demand of the installation amounted to a significant percentage of the production rate of the city treatment plant. When the city water is available, the water can be pumped directly into semitrailer mounted fabric tanks (SMFTs), tanker trucks, or trailers.

b. Reverse Osmosis Water Purification Units.

(1) Another alternate water supply is to use Reverse Osmosis Water Purification Units (ROWPU), which are available from the US Army inventory at _____. Production rates for 600 GPD, 900 GPD, and 3000 GPD ROWPU's are given in the table. The ROWPU's can be used to purify water from surface water sources.

Table. Estimated ROWPU Capacities

Water Demand (GPD)	Production Rate		Down Time	Production Rate	Number of
	Rated (GPH)	Actual (GPH)	(%)	(GPD)	ROWPU's Required
Demand (GPD)	600	500	20	9,600	Demand (GPD)/ Production Rate (GPD)
"	900*	750	20	14,400	"
"	3,000	2,450	20	47,040	"

* Production rate of 600 GPD ROWPU can be increased to 900 GPD under certain conditions. Actual production may be much less than indicated given poor source water conditions.

(2) In order for the ROWPU's to operate properly, they must have a water storage tank, or stationary open water source from which to draw. The ROWPU's CANNOT be directly connected to the wells. Depending on the extent of the damage to the system, ROWPU's can draw from the undamaged storage tanks. If all the storage tanks are contaminated, or otherwise unusable, a SMFT or a 2,000 gallon collapsible fabric tank (Onion Blivit), can be used. If the ground wells are damaged, a surface water source can be used. The potential surface water sources in the area are _____ and _____ (Note: name the sources as applicable), which are located approximately _____ miles (Note: mention the distance as applicable) from the installation. After drawing the water from a surface source, the ROWPU should then be emptied into a similar holding tank, to be distributed later.

(3) Although ROWPU's are capable of removing almost any contaminants out of water, they are easily fouled by organic chemicals (e.g., TCE, diesel, etc.), calcium, magnesium, and several other contaminants. To prevent this, the water should be pretreated with an activated carbon filter, or an aeration tower. Activated carbon filters are available for the ROWPU's. For more information on proper set-up, operation, and maintenance of ROWPU's, please refer to FM 10-52-1.

(4) During an emergency situation, the expected water demand for the installation will be _____ gallons per day (Note: mention the estimated potable water demand during an emergency in consideration of the recommended water use restrictions and conservation measures). __ ROWPU's would be needed to fulfill this demand, assuming a 20 percent down-time for each ROWPU for maintenance and repairs.

c. The TWDS. Ideally, in a water crisis, a tactical water distribution system (TWDS) would be used in conjunction with the ROWPU's. TWDS are currently available in __. Water buffalos and trucks should be used, as described above.

d. Bottled Water. In extreme cases, when no other water source is available, procedures for the purchase and distribution of bottled water need to be followed. The recommended bottled water storage is 1.5 gallons/resident and 0.5 gallons/non-resident. It is preferable that individuals store their own bottled water. This would ease the difficulties of mass distribution and storage.

e. Swimming Pool. Water from the swimming pool can be used for non-potable applications, such as fire protection.

f. Surface Water (Note: name the source). As an absolute last resort, surface water can be utilized. If the surface water is to be used, obtain ROWPU's from the __.

g. Alternate Point on the System. In the case of a broken pipe or a partial system shut-down, any point on the system that is not affected can be used as an alternate source. Water towers, and the water treatment plant are ideal places for alternate water source points.

3. Distribute Water.

a. Obtain Transportation Equipment.

(1) _____ has two-1,000 gallon tanker trucks.

(2) ____, has twenty-four 400 gallon water trailers (water buffaloes) in war-stock that must be cleaned before use.

(3) ____ has 5,000 gallon SMFT's.

b. Treat Water.

(1) Use the ROWPU's as described above.

(2) Add chlorine in the amount specified by the Preventive Medicine Detachment.

c. Distribute Water.

(1) Place water in trailers and trucks as recommended by the DEH, in consultation with the Environmental Office and the Chief of Utilities.

(2) In case of a partial system failure, place trucks and trailers only in the areas that are without water.

(3) Adjust water points as necessary. If water trailers are unused, or overused, adjust to put the supply where the demand is.

d. End Operation.

(1) Return water trailers to war stock.

(2) Return SMFT's and ROWPU's to __.

(3) Empty and clean tanker trucks or storage tanks.

APPENDIX L

PRIORITY SERVICE LIST

TABLE
SAMPLE PRIORITY SERVICE LIST

	Quality Problem	Quantity Problem	Reduce Use
Medical/Dental Facilities			
Hospital	X	X	
Clinics and offices	X		
Emergency clinics/outpatient	X	X	
Kidney dialysis patients	X	X	
Blood bank	X		
Public Facilities			
Schools and preschools	X	X	
Day-care centers	X	X	
Emergency shelters	X	X	
Stadiums, arenas, and convention centers	X	X	
Parks and cemeteries		X	
Wholesale suppliers		X	
Emergency-operations centers	X	X	
Fire and police stations/jails	X	X	
Large Users			
Large industrial users		X	
Wholesale customers	X	X	
High-rise buildings		X	
Contractors		X	
Steam Plants		X	
Sawmills			X
Nonessential users			X
Food and Beverage Facilities			
Dairies	X	X	X
Soft drink bottlers	X	X	
Breweries and wineries	X	X	
Bakeries	X		
Restaurants	X	X	
Food processors	X	X	X
Critical Businesses			
Beauty shops		X	
Dry cleaners		X	
Fish markets	X		
Newspapers (printing facilities)		X	
Large computer facilities		X	
Hotels and motels	X	X	
Hatcheries	X	X	
Photo processors		X	
High-degree-of-hazard users (cross-connection potential)		X	

FORM
PRIORITY SERVICE CALL-UP LIST*
Disaster Event and Date:_____

Last Data Update on_____ by_____. Next Update Needed (1/yr min) by_____(date).

Individuals/organizations located at the following service connections are critically dependent on an uninterrupted supply of water. Provide current contact information in advance. In the event of an emergency affecting their primary source, the following actions must be taken:

1. Notify the customer immediately. Verify that the second source, if any, is functioning.
2. Take the indicated emergency action, if required.

Contact (if attempted contact, mark time, if contact, circle time, go to log)	Business Name	Point-of-Contact	Business Address	Telephone (24 hour)	Reason for Requesting Priority Service	Own Alternate Source Available Yes No	Emergency Action(s) to be Taken
Date:			Approved:				

* To be completed and used by water system personnel.

(form date - 2/98) *Adapted from Source: Washington State (1982).*

APPENDIX M - TABLE
POTABLE WATER PLANNING GUIDE
ARMY POTABLE WATER CONSUMPTION PLANNING FACTORS

CONVENTIONAL THEATER

WATER CONSUMPTION PLANNING FACTORS RELATED TO MILITARY PERSONNEL IN FORCE STRUCTURE
(GALLONS PER MAN PER DAY)

FUNCTION	HOT				TEMPERATE		COLD	
	TROPICAL		ARID					
	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum	Sustaining	Minimum
Universal Unit Level Consumption[1]	7.70	5.00	7.90	5.20	6.10	3.40	6.60	3.90
Level I and II Medical Treatment	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Central Hygiene, Shower and Laundry[2]	9.80	0	9.80	0	9.80	0	9.80	0
Level III and IV Medical Treatment	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Mortuary Affairs Operations	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Engineer Operations	1.20	0	1.20	0	1.20	0	1.20	0
Aircraft Maintenance Operations	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
POTABLE WATER PLANNING FACTORS	**9.30**	**6.60**	**20.80**	**7.10**	**7.70**	**5.00**	**8.20**	**5.50**
Nonpotable Water Requirements	*11.30*	*0.30*	*0.00*	*0.00*	*11.30*	*0.30*	*11.30*	*0.30*
TOTAL THEATER WATER CONSUMPTION	20.60	6.90	20.80	7.10	19.00	5.30	19.50	5.80

[1]Includes Gal/Man/Day and/or Per Capita requirements for drinking, personal hygiene, field feeding, heat injury treatment, and vehicle maintenance as described in Section II-A of the "Potable Water Planning Guide" (PWPG).

[2]Based on a central hygiene standard of 2 showers and 15 pounds of laundry per soldier per week as described in Section II-A of the PWPG.

APPENDIX N

SAMPLE VULNERABILITY ASSESSMENT MATRICES

TABLE 1. SAMPLE OVERALL VULNERABILITY ASSESSMENT MATRIX - PART 1

System Components -- Likely damage, loss, or shortage due to hazards. Note potential hazards to (L)ife & (P)riority service	Earth-quakes	Hurri-canes	Torna-does	Flood	Forest /Brush Fires	Volcano Eruptions	Other Severe Weather	Water-borne Disease	Hazardous Material
Estimated Probability	1/60 years	low	low	low-medium	high	1/300 yrs	may divide significant	low	may elaborate on all hazards
Estimated Magnitude	7.0 Richter					150 mi. away	hazards into		in the disaster-specific
Comments	multiple hazards				Dry Creek	MT Nueces	separate columns		matrix
Administration/operations									
Personnel	X	X					X	X	
Facilities/Equipment	X	X	X	X	X	X			
Records	X	X	X	X	X				
Source water									
Watersheds/surface sources		X		X	X	X		X	X
Reservoirs and dams	X	X		LP				X	X
Groundwater sources				X				X	X
Wells and galleries	X	X	X	X		X	X	X	X
Transmission									
Intake structures	X		X	X		X	X		
Aqueducts	X								
Pump Stations	X	X	X	X	X	X	X		
Pipelines, valves	X						X		
Treatment									
Facility structures	X	X	X	P	X	X	X		
Controls	X	X	X	P	X	X	X		
Equipment	X	X	X	P	X				
Chemicals	X	X	X	X	X				
Storage									
Tanks	X	X	X		X	X	X	X	X
Valves	X						X		
Piping	X						X		
Distribution									
Pipelines, valves	X	X					X	X	X
Pumps or PRV stations	X	X	X	P	X	X	X		
Materials	X	X		X	X				
Electric power									
Substations	X	X	X	X	X		X		
Transmission lines	X	X	X	X	X		X		
Transformers	X	X	X	X	X	X	X		
Standby generators				P					
Transportation									
Vehicles		X	X	X	X		X		
Maintenance facilities	X	X	X	X	X		X		
Supplies		X		X	X				
Roadway infrastructure	X			L		X	X		
Communications									
Telephone	X	X	X	X	X		X		
Two-way radio									
Telemetry	X		X	X	X	X			

SAMPLE OVERALL VULNERABILITY ASSESSMENT MATRIX - PART 2

System Components- Damage, loss, or shortage due to hazards. Note potential hazards to (L)ife & (P)riority service	Structure Fire	Construc-tion Accidents	Transpor-tation Accidents	Nuclear	Sabotage	Computer Virus	Emergency Mobilization	Other
Estimated Probability	low	mediium	may subdivide	low	medium	medi-um	medium	widen column
Estimated Magnitude			hazards into separate	contami-nation				to elabo-
Comments		older areas of system	columns	Lake West Reservoir	storage tanks			rate as needed
Administration/operations								
Personnel		X	X	X	X			
Facilities/Equipment	X			X	X	X		
Records	X				X	X		
Source water								
Watersheds/surface sources				X	X		X	
Reservoirs and dams				X	X			
Groundwater sources				X	X		X	
Wells and galleries					X			
Transmission								
Intake structures			X		X			
Aqueducts		X	X		X			
Pump Stations	X	X	X		X	X	X	
Pipelines, valves		X			X	X		
Treatment								
Facility structures	X	X	X	X	X			
Controls	X	X	X		X	X		
Equipment	X	X	X	X	X			
Chemicals	X				X		X	
Storage								
Tanks	X		X	X	X			
Valves			X		X	X		
Piping								
Distribution								
Pipelines, valves		X			X	X		
Pumps or PRV stations	X	X	X		X	X		
Materials	X				X			
Electric power								
Substations	X	X	X	X	X			
Transmission lines	X	X	X		X			
Transformers	X	X	X		X			
Standby generators	X				X			
Transportation								
Vehicles		X	X		X			
Maintenance facilities	X		X		X			
Supplies	X				X			
Roadway infrastructure		X	X		X			
Communications								
Telephone	X	X	X		X			
Two-way radio					X			
Telemetry					X	X		

OVERALL VULNERABILITY ASSESSMENT MATRIX FORM 1 - PART 1

Date assessed: _____ Facility:_____Assessor: _____

System Components -Damage, loss, or shortage due to hazards. Note potential hazards to (L)ife & (P)riority service	Earth-quakes	Hurri-canes	Tornadoes	Flood	Forest /Brush Fires	Volcano eruptions	Other Severe Weather	Waterborne Disease	Hazardous Material
Estimated Probability									
Estimated Magnitude									
Comments									
Administration/operations Personnel Facilities/Equipment Records									
Source water Watersheds/surface sources Reservoirs and dams Groundwater sources Wells and galleries									
Transmission Intake structures Aqueducts Pump Stations Pipelines, valves									
Treatment Facility structures Controls Equipment Chemicals									
Storage Tanks Valves Piping									
Distribution Pipelines, valves Pumps or PRV stations Materials									
Electric power Substations Transmission lines Transformers Standby generators									
Transportation Vehicles Maintenance facilities Supplies Roadway infrastructure									
Communications Telephone Two-way radio Telemetry									

(form date: 2/98)

OVERALL VULNERABILITY ASSESSMENT MATRIX FORM 1- PART 2

Date assessed: _____ Facility:_____Assessor: _____

System Components -Damage, loss, or shortage due to hazards. Note potential hazards to (L)ife & (P)riority service	Structure Fire	Construc-tion Accidents	Transpor-tation Accidents	Nuclear	Sabotage	Computer Virus	Emergency Mobilization	Other
Estimated Probability								
Estimated Magnitude								
Comments								
Administration/operations Personnel Facilities/Equipment Records								
Source water Watersheds/surface sources Reservoirs and dams Groundwater sources Wells and galleries								
Transmission Intake structures Aqueducts Pump Stations Pipelines, valves								
Treatment Facility structures Controls Equipment Chemicals								
Storage Tanks Valves Piping								
Distribution Pipelines, valves Pumps or PRV stations Materials								
Electric power Substations Transmission lines Transformers Standby generators								
Transportation Vehicles Maintenance facilities Supplies Roadway infrastructure								
Communications Telephone Two-way radio Telemetry								

(form date: 2/98)

TABLE 2

SAMPLE DISASTER-SPECIFIC VULNERABILITY ASSESSMENT

Hazard Flood Date Assessed 2/98 Facility Camp Swampy Assessor Mr. Smith

Additional Disaster Information:

System Components - Likely damage, loss, or shortage due to hazards	Hazard to (L)ife (P)riority	Type of Damage, Description	Other Effects/Impacts Caused or to Which Susceptible	Mitigation Needed?
Administration/operations				
Personnel				
Facilities/Equipment	X			
Records	X			
Source water				
Watersheds/surface sources	X			
Reservoirs and dams	LP			
Groundwater sources	X			
Wells and galleries	X			
Transmission				
Intake structures	X			
Aqueducts				
Pump Stations	X			
Pipelines, valves				
Treatment				
Facility structures	P			
Controls	P			
Equipment	P			
Chemicals	X			
Storage				
Tanks				
Valves				
Piping				
Distribution				
Pipelines, valves				
Pumps or PRV stations	P			
Materials	X			
Electric power				
Substations	X			
Transmission lines	X			
Transformers	X			
Standby generators	P			
Transportation				
Vehicles	X			
Maintenance facilities	X			
Supplies	X			
Roadway infrastructure	LX			
Communications				
Telephone	X			
Two-way radio				
Telemetry	X			

(form date: 2/98)

Additional comments:

FORM 2

DISASTER-SPECIFIC VULNERABILITY ASSESSMENT

Hazard_____ Date Assessed_____ Facility _____Assessor_____

Additional Disaster Information:

System Components - Likely damage, loss, or shortage due to hazards	Hazard to (L)ife (P)riority	Type of Damage, Description	Other Hazards/Effects/Impacts Caused or toWhich Susceptible	Mitigation Needed?
Administration/operations Personnel Facilities/Equipment Records				
Source water Watersheds/surface sources Reservoirs and dams Groundwater sources Wells and galleries				
Transmission Intake structures Aqueducts Pump Stations Pipelines, valves				
Treatment Facility structures Controls Equipment Chemicals				
Storage Tanks Valves Piping				
Distribution Pipelines, valves Pumps or PRV stations Materials				
Electric power Substations Transmission lines Transformers Standby generators				
Transportation Vehicles Maintenance facilities Supplies Roadway infrastructure				
Communications Telephone Two-way radio Telemetry				

(form date: 2/98)

Additional comments: